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August 2016

FDMC89521L

Dual N-Channel PowerTrench® MOSFET

60 V, 8.2 A, 17 mΩ

Features

- Max $r_{DS(on)}$ = 17 mΩ at $V_{GS} = 10$ V, $I_D = 8.2$ A
- Max $r_{DS(on)}$ = 27 mΩ at $V_{GS} = 4.5$ V, $I_D = 6.7$ A
- Termination is Lead-free
- RoHS Compliant

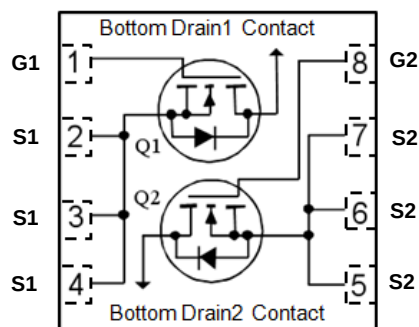
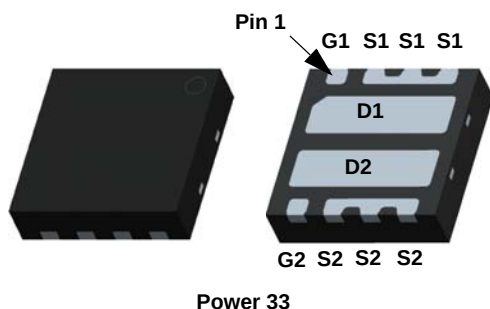


General Description

This device includes two 60 V N-Channel MOSFETs in a dual Power 33 (3 mm X 3 mm MLP) package. The package is enhanced for exceptional thermal performance.

Applications

- Battery Protection
- Load Switching
- Bridge Topologies



MOSFET Maximum Ratings $T_A = 25^\circ\text{C}$ unless otherwise noted.

Symbol	Parameter	Ratings	Units
V_{DS}	Drain to Source Voltage	60	V
V_{GS}	Gate to Source Voltage	± 20	V
I_D	Drain Current -Continuous $T_A = 25^\circ\text{C}$ (Note 1a)	8.2	A
	-Pulsed	40	
E_{AS}	Single Pulse Avalanche Energy (Note 3)	32	mJ
P_D	Power Dissipation $T_C = 25^\circ\text{C}$	16	W
	Power Dissipation $T_A = 25^\circ\text{C}$ (Note 1a)	1.9	
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to +150	$^\circ\text{C}$

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case	8.0	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	65	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1b)	155	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDMC89521L	FDMC89521L	Power 33	13 "	12 mm	3000 units

Electrical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted.

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
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Off Characteristics

BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = 250\ \mu\text{A}$, $V_{GS} = 0\ \text{V}$	60			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$, referenced to 25°C		30		mV/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 48\ \text{V}$, $V_{GS} = 0\ \text{V}$			1	μA
I_{GSS}	Gate to Source Leakage Current	$V_{GS} = \pm 20\ \text{V}$, $V_{DS} = 0\ \text{V}$			± 100	nA

On Characteristics

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$, $I_D = 250\ \mu\text{A}$	1	1.9	3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$, referenced to 25°C		-6		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\ \text{V}$, $I_D = 8.2\ \text{A}$		13	17	m Ω
		$V_{GS} = 4.5\ \text{V}$, $I_D = 6.7\ \text{A}$		21	27	
		$V_{GS} = 10\ \text{V}$, $I_D = 8.2\ \text{A}$, $T_J = 125^\circ\text{C}$		20	26	
g_{FS}	Forward Transconductance	$V_{DS} = 10\ \text{V}$, $I_D = 8.2\ \text{A}$		28		S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 30\ \text{V}$, $V_{GS} = 0\ \text{V}$, $f = 1\ \text{MHz}$		1228	1635	pF
C_{oss}	Output Capacitance			243	325	pF
C_{rss}	Reverse Transfer Capacitance			10	15	pF
R_g	Gate Resistance			0.7		Ω

Switching Characteristics

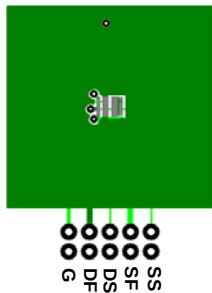
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 30\ \text{V}$, $I_D = 8.2\ \text{A}$, $V_{GS} = 10\ \text{V}$, $R_{GEN} = 6\ \Omega$		7.9	16	ns
t_r	Rise Time			2.1	10	ns
$t_{d(off)}$	Turn-Off Delay Time			18	33	ns
t_f	Fall Time			1.7	10	ns
Q_g	Total Gate Charge	$V_{GS} = 0\ \text{V}$ to $10\ \text{V}$		17	24	nC
Q_g	Total Gate Charge	$V_{GS} = 0\ \text{V}$ to $4.5\ \text{V}$	$V_{DD} = 30\ \text{V}$, $I_D = 8.2\ \text{A}$	7.9	12	nC
Q_{gs}	Gate to Source Charge			3.8		nC
Q_{gd}	Gate to Drain "Miller" Charge			1.9		nC

Drain-Source Diode Characteristics

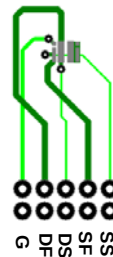
V_{SD}	Source-Drain Diode Forward Voltage	$V_{GS} = 0\ \text{V}$, $I_S = 8.2\ \text{A}$ (Note 2)		0.85	1.3	V
		$V_{GS} = 0\ \text{V}$, $I_S = 1.6\ \text{A}$ (Note 2)		0.75	1.2	
t_{rr}	Reverse Recovery Time	$I_F = 8.2\ \text{A}$, $di/dt = 100\ \text{A}/\mu\text{s}$		25	40	ns
Q_{rr}	Reverse Recovery Charge			11	20	nC

Notes:

1. $R_{\theta JA}$ is determined with the device mounted on a 1 in² pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR-4 material. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



a. 65°C/W when mounted on
a 1 in² pad of 2 oz copper



b. 155°C/W when mounted on
a minimum pad of 2 oz copper

2. Pulse Test: Pulse Width < 300 μs , Duty cycle < 2.0%.

3. E_{AS} of 32 mJ is based on starting $T_J = 25^\circ\text{C}$, $L = 1\ \text{mH}$, $I_{AS} = 8\ \text{A}$, $V_{DD} = 54\ \text{V}$, $V_{GS} = 10\ \text{V}$. 100% tested at $L = 3\ \text{mH}$, $I_{AS} = 5.4\ \text{A}$.

Typical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted.

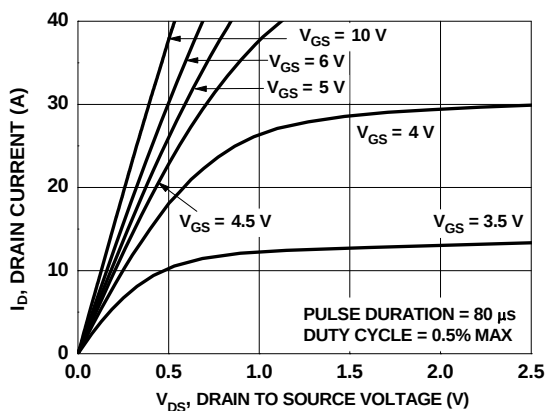


Figure 1. On Region Characteristics

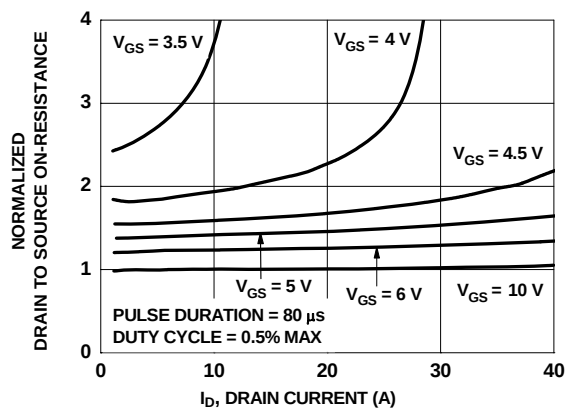


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

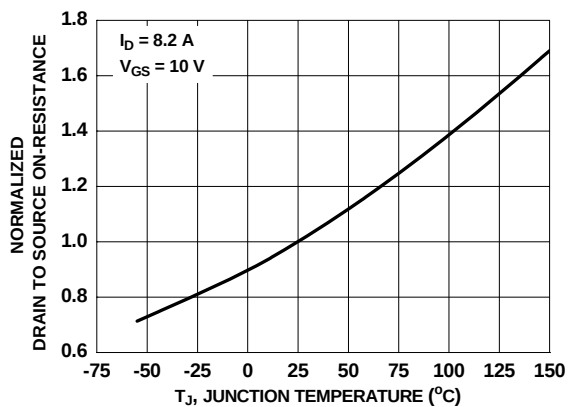


Figure 3. Normalized On Resistance vs. Junction Temperature

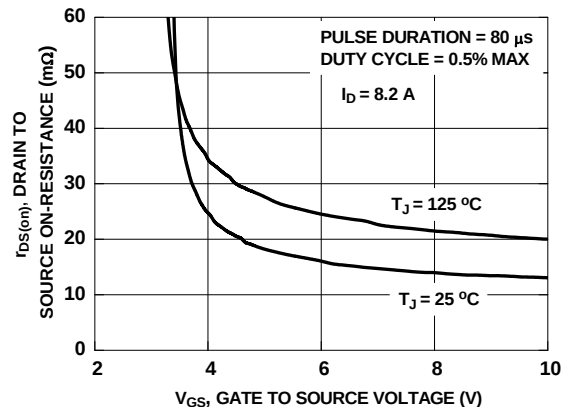


Figure 4. On-Resistance vs. Gate to Source Voltage

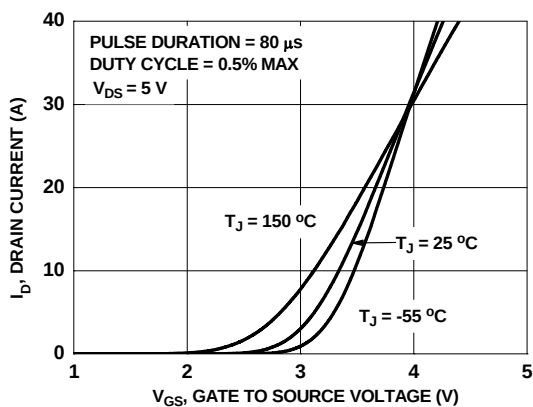


Figure 5. Transfer Characteristics

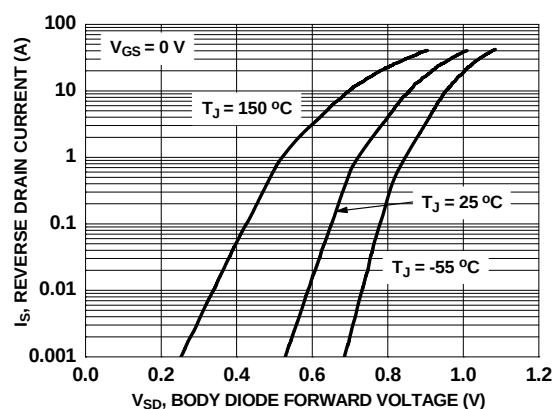


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

Typical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted.

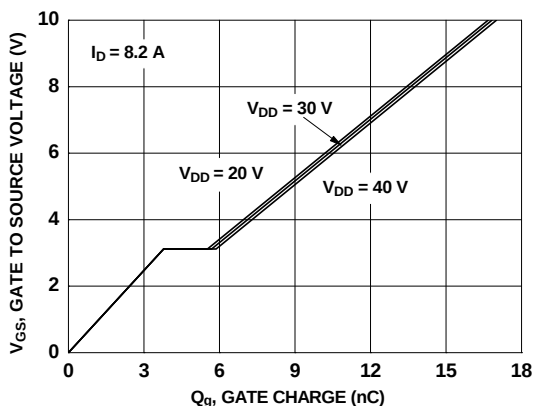


Figure 7. Gate Charge Characteristics

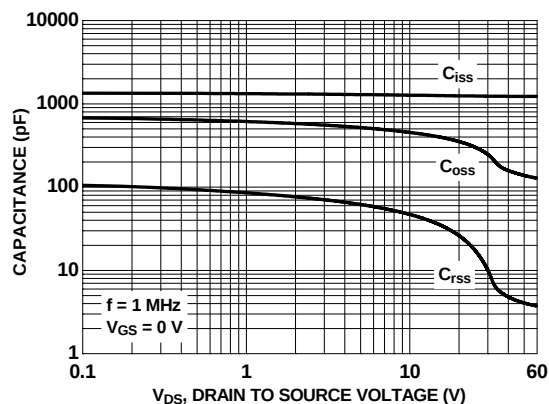


Figure 8. Capacitance vs. Drain to Source Voltage

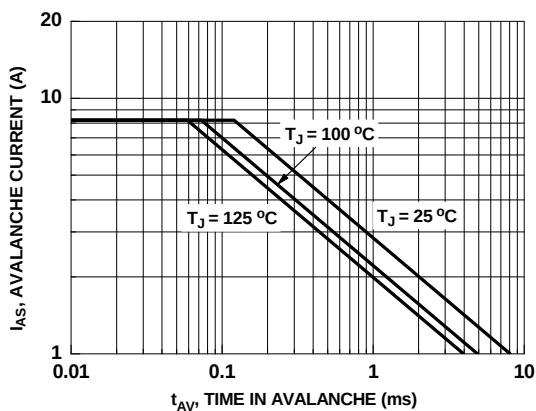


Figure 9. Unclamped Inductive Switching Capability

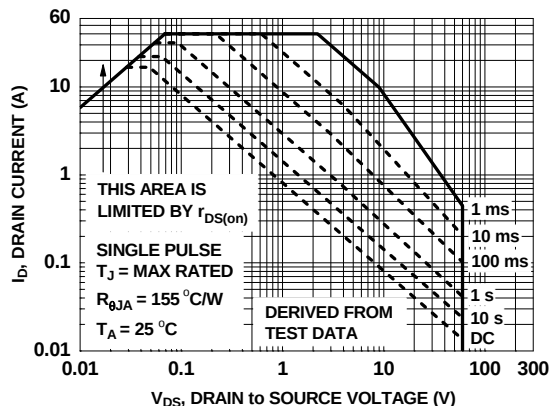


Figure 10. Forward Bias Safe Operating Area

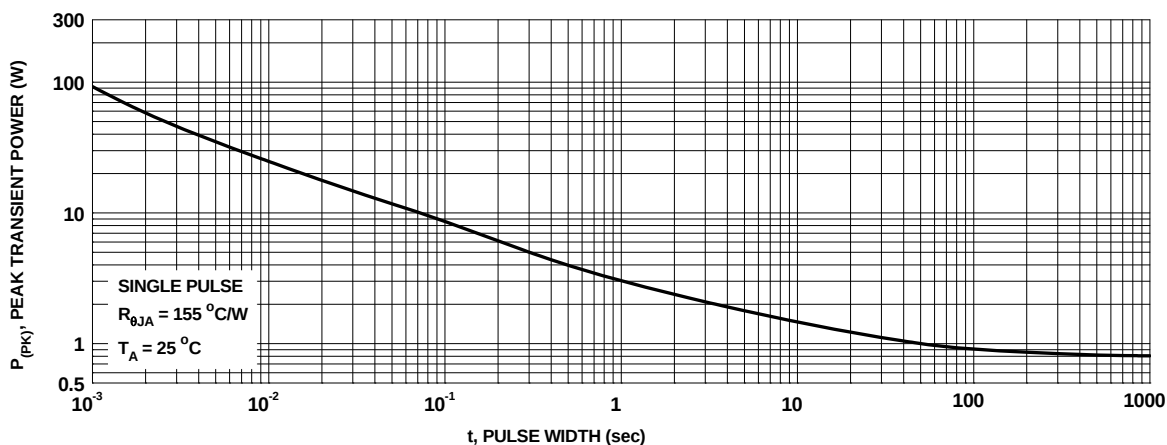


Figure 11. Single Pulse Maximum Power Dissipation

Typical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted.

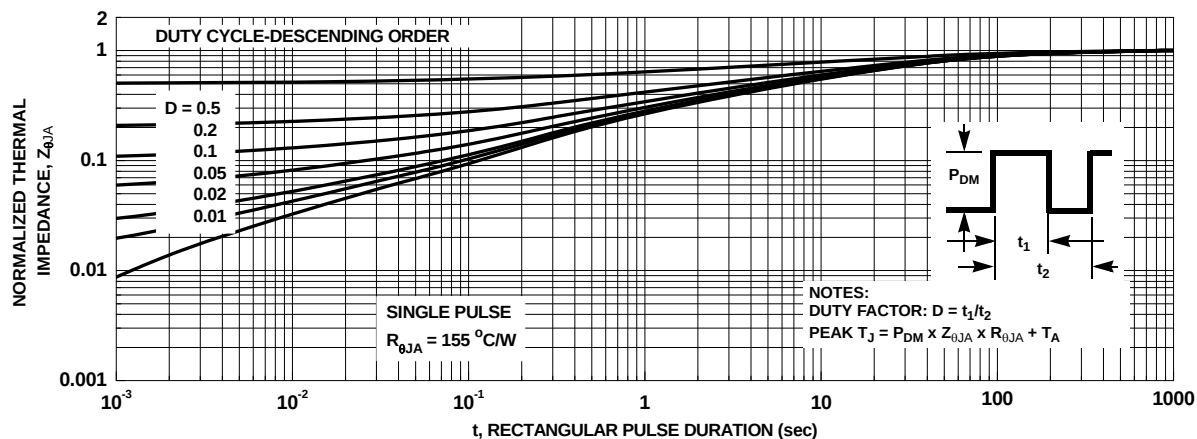
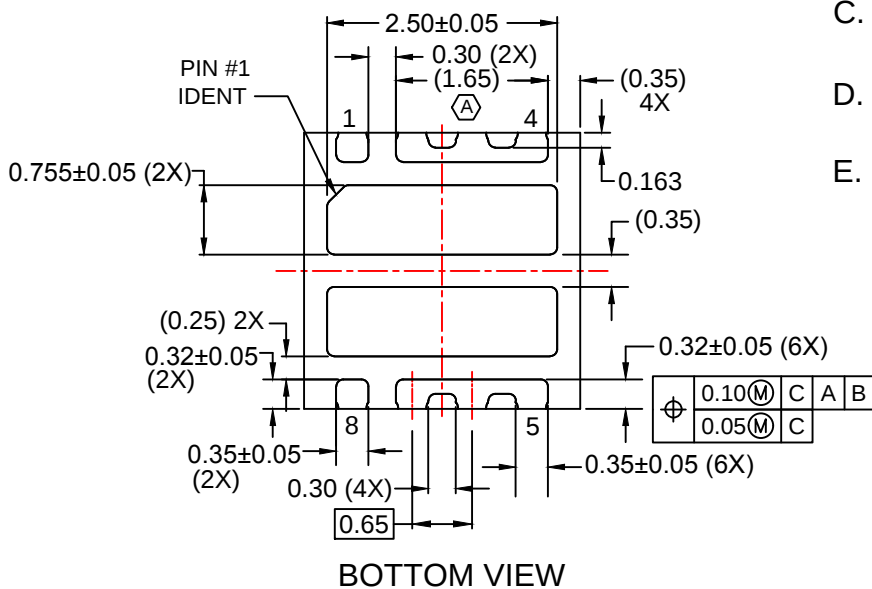
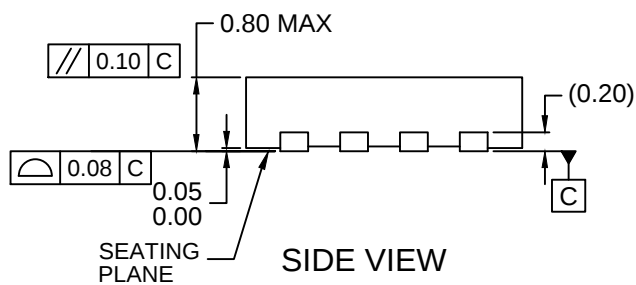
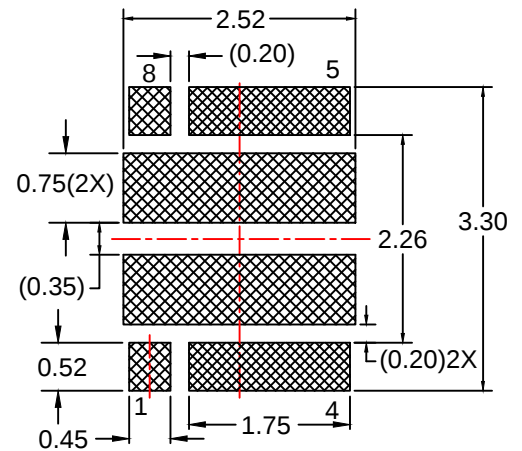
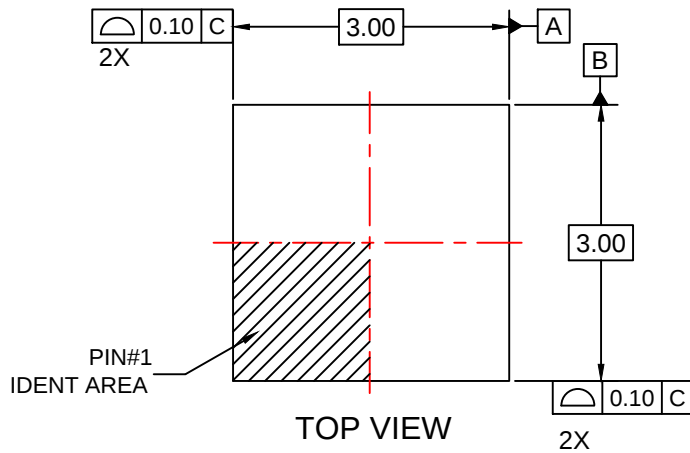


Figure 12. Junction-to-Ambient Transient Thermal Response Curve



NOTES:

- A. DOES NOT FULLY CONFORM TO JEDEC REGISTRATION, MO-229.
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994
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